# 2006 SEATTLE ENERGY CODE: Overview

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Seattle Energy Code Public Training

Seattle, 29 April 2008

# OUTLINE

- 2006 Seattle Energy Code development:
  *context & goals, public review process, impacts*
- Building envelope:
  *nonresid. new construction, alterations, resid.*
- Mechanical & RS-29:
  *nonresid. new construction, alterations, resid.*
- Lighting:
  *nonresid. new construction, alterations, resid.*
- Further information

# 2006 SEATTLE ENERGY CODE: Development - Context & Goals

- Lead agencies: *Seattle DPD, City Light*
- Context: *Mayor's Climate Protection Initiative, Natl Conf of Mayor's vote for 2030 Challenge*
- Charge/Goals:

*1. achieve the energy savings in Resolution 30280: 20% improvement over current version of ASHRAE/IESNA Std. 90.1 for nonresidential (no Seattle residential changes, per State law)*

*2. improve implementation of existing amendments*

# 2006 SEATTLE ENERGY CODE: Development - Public Review Process

- CCAB (Constr.Code.Adv.Bd.) briefing: *fall 2006*
- Public review (incl. 5 mtgs): *January-March 2007*
- Presentations to professional organizations (AIA, ASHRAE, BOMA, IES): *Jan-Feb 2007*
- CCAB recommendations: *March 2007*
- Mayor/City Council review: *summer 2007*
- Effective date: *ordinance effective 10 Nov 2007, application grace period to 8 Jan 2008*

# 2006 SEATTLE ENERGY CODE: Overview

- Many existing Seattle amendments are retained with no changes
- Some existing Seattle amendments are modified solely to reflect partial adoption into WSEC
- A number of Seattle amendments are incorporated into the WSEC and so are no longer needed
- Proposed new Seattle amendments

# 2006 SEATTLE ENERGY CODE: Comparison with 2004 SEC

- Std 90.1-2004 versus 90.1-2001: *~10% savings*
- 2006 SEC versus to 2004 SEC: *~10% savings*
- Envelope: *~ 4% savings (20% reduction in loads due to U-factor, SHGC, air leakage, vestibules)*
- Mechanical: *~ 4% savings (higher equipment efficiency, more economizer, more heat recovery, more VFD, more motorized dampers)*
- Lighting: *~ 2% savings (lower office/retail W/ft$^2$)*

# 2006 SEATTLE ENERGY CODE: Comparison with 2004 SEC

- Changes are NOT uniform across the SEC
- Envelope: *opaque more stringent for other fuels, fenestration more stringent for <30% area*
- Mechanical: *30% higher SEER (to 13 from 10) higher chiller efficiency, but no changes in furnace or boiler efficiency*
- Lighting: *reduction in wattage for office & retail, lighting on partition systems no longer exempt, but no change for schools, increase for bars*

# 2006 SEATTLE ENERGY CODE: Comparison with 2004 SEC

- Biggest change: *mixed-use building with retail spaces > 3,000 $ft^2$ and offices where lighting is installed on partition system, steel stud walls, window area <30% of wall area, w/small rooftop air conditioning units*
- Little change: *restaurant/bar with wood stud walls, heated by electric resistance or small boiler, but with no air conditioning*

# 2006 SEATTLE ENERGY CODE: Use w/Std 90.1-2004 & LEED

- 2006 Seattle Energy Code does NOT comply with LEED EA prerequisite 2, Minimum Energy Performance: *SEC does not include all mandatory measures in 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 of 90.1*
- Getting closer: *2006 SEC now has 90.1 air leakage rates, loading dock weatherseals, vestibules, motorized dampers (but State Code does not)*
- But still missing: *some duct leakage tests, voltage drop limits, and tandem wiring of ballasts*

# 2006 SEATTLE ENERGY CODE: Use w/Std 90.1-2004 & LEED

- 2006 Seattle Energy Code yields a RANGE of energy savings under LEED EA credit 1, Optimize Energy Performance: *do NOT count on 20%*
- Envelope: *now more stringent, esp. semi-heated, but varies by construction material & system*
- Mechanical: *more savings w/economizer & chiller, but no fan criteria so 90.1 baseline can be a challenge for VAV systems w/series fan units*
- Lighting: *little savings for most use categories, but automatic lighting control in daylight zones*

# 2006 SEATTLE ENERGY CODE: Building Envelope – New Construction

- Opaque assemblies and glazing (Table 13-1):
  *revise U-factor (opaque & glazing), SHGC to be comparable to electric resistance criteria (minimize space heating variations)*
- Opaque assemblies: less thermal bridges
  *metal stud walls: R-13 + R-7.5 cont.insul.*
  *masonry: R-12 cont.(ext), R-13 + R-6 cont.(int)*
- Glazing: good performance day & night
  *U-0.40 max: low-e, argon, t.b.frame/spacer*
  *SHGC-0.35 or SHGC-0.40 w/0.3 overhang*

# 2006 SEATTLE ENERGY CODE: Building Envelope – New Construction

- Semiheated spaces (1310)
  *clarify that these are calculated separately*
- Air leakage: revised to match Std 90.1 (1314)
  *air leakage ratings for glazing products, loading dock weatherseals, vestibules*
- Default table revisions to match Std 90.1 (Ch.10)
  *updated metal building wall and roof tables*
  *added table for insulation above deck*

# 2006 SEATTLE ENERGY CODE: Building Envelope – Additions et al

- Additions (1131, no change) & altered portions:
  *comply with new construction requirements*
- Change of use (1133, no change):
  *unheated to heated – comply as new construc.*
  *Group R to other – treat as alteration*
- Historic buildings (1134, no change):
  *special treatment for historic component only (usually applies to upper level facades, but NOT most street-level storefronts)*

# 2006 SEATTLE ENERGY CODE: Building Envelope – Alterations

- Glazing (1132.1, 1323 except.1, no change):

  *U-factor to match Table 13-1, but*
  *SHGC allowed to match existing SHGC*
  *storefront windows to have double w/low-e*
  *(like Westlake Center), and good VT*
  *but exempt from SHGC requirements*

- Opaque assemblies (1132.1, no change):

  *existing wall: okay to fill cavity with insulation*
  *existing roof: must insulate to Table 13-1 when*
  *sheathing is exposed*

# 2006 SEATTLE ENERGY CODE: Building Envelope – Residential

- Prescriptive Glazing (Table 6-1, revised):

  *single-family/duplex: U-0.35 max. for all*
  *multi-family & hotel: still has U-0.40 option*
  *opaque doors: U-0.20, not in with glazing*

- Opaque assemblies (Table 6-1, revised):

  *R-values: no change, but R-30"exception" for single-rafter vaulted ceiling now limited to 500 $ft^2$ per dwelling unit per footnote 3*
  *U-factors: above-grade wall value for multi-family/hotel revised for consistency*

# 2006 SEATTLE ENERGY CODE: Building Envelope – Residential

- Target UA (Table 5-1, revised):

  *parallel changes to Prescriptive*
  *glazing U-0.35 single-family, U-0.40 multi-fam.*
  *above-grade wall U-0.057 for all fuels*
  *single-rafter ceiling U-0.034 limited to 500 $ft^2$*

- Systems analysis (Chapter 4, revised):

  *standard design SHGC to be per Table 13-1*
  *mechanical system to be same in both*
  *equipment efficiency to be per Chapter 14*

# 2006 SEATTLE ENERGY CODE: Building Envelope – Residential

- Recessed lighting fixtures (502.4.4, revised):

  *where installed in the building envelope, all must now be IC-rated, and tested and certified to be 2.0 cfm max. per ASTM E283, and installed with gasket or caulk*

- Outdoor lighting (505.3, new):

  *light fixtures attached to a residential building to be (a) high-efficacy or (b) controlled by motion-sensor with integral photosensor*

# 2006 SEATTLE ENERGY CODE: Reference Info: Building Envelope

- Client Assistance Memos (CAM):
  303: Single-Family and Two-Unit Dwellings
  303A: Common Residential Requirements
  316: Subject-to-Field-Inspection (STFI) Permits
  322: Spray-Applied Foam Insulation
  403: NFRC Glazing U-Factors and SHGC
- Electronic forms:
  Other than Group R Target UA
  Group R Occupancy Target UA
  Equipment Sizing Form

# 2006 SEATTLE ENERGY CODE: DPD Process: Building Envelope

- Building permit application:
  Group R: need to include heating equipment sizing form for every unit
- Field inspection:
  Provide NFRC Label Certificates to building inspector

# 2006 SEATTLE ENERGY CODE: Mechanical – New Construction

- HVAC equipment performance (1411):

  *equipment to be listed in ARI certification dir.*
  *all chillers to comply at nearest table value*
  *heating systems in unenclosed spaces required to have occupancy sensor controls*

- Motorized dampers (1412.4):

  *required for all intakes & exhausts > 300 cfm (exemptions for low-rise buildings deleted to match Std 90.1, 6.4.3.3.3)*

# 2006 SEATTLE ENERGY CODE: Mechanical – New Construction

- Simple systems (1422-1423): *same as complex*
- Economizer (1433): *air economizer is baseline*
- Economizer exceptions (1433):

  *#1: limited to units that comply with all of these:*

  *- in the interior of buildings,*

  *- very small units (< 33,000 Btuh, < 3 tons)*

  *- efficiency 15%+ above Table 14-1A,B,D*

  *- maximum of 72,000 Btuh (6 tons) per bldg or 5% of air economizer capacity*

# 2006 SEATTLE ENERGY CODE: Mechanical – New Construction

- Economizer exceptions, continued (1433):

  *#2: limited to terminal units that comply w/ both:*
  *- chiller efficiency 10%+ above Table 14-1C*
  *- maximum of 72,000 Btuh/bldg or 5% of econ.*

  *#3: water econ. deleted (no change, formerly #2)*

  *#6: limited to systems w/ dehumidification problems*

  *#7: water source heat pump loops limited to small units (no change, formerly #6)*

  *#9: computer server rooms with higher efficiency units and waterside economizer (no change, except informative note, formerly #8)*

# 2006 SEATTLE ENERGY CODE: Mechanical – New Construction

- Heat recovery (1436):
  *with >5,000 cfm and >70% outside air*
  *with >10,000 cfm and >50% outside air*
  *with >20,000 cfm and >30% outside air*
- Fan motor efficiencies (1437, no change):
  *fans < 1 hp in series terminal units to have electronically-commutated motors (ECM)*
- Fan control (1438):
  *VFD for all fans and pumps ≥ 7.5 hp*

# 2006 SEATTLE ENERGY CODE: Mechanical – New Construction

- Chiller efficiencies (Table 14-1C):

  *revised full-load COP (no change)*

  *revised part-load IPLV (changed)*

  *0.95 kW/ton, 3.70 IPLV: air-cooled w/condenser*

  *0.85 kW/ton, 4.15 IPLV: air-cooled w/o condenser*

  *0.63 kW/ton, 5.55 IPLV: water-cooled < 40 tons*

  *0.61 kW/ton, 5.80 IPLV: water-cooled < 150 tons*

  *0.54 kW/ton, 6.50 IPLV: water-cooled < 300 tons*

  *0.50 kW/ton, 7.05 IPLV: water-cooled > 300 tons*

# 2006 SEATTLE ENERGY CODE: Mechanical – Additions et al

- Additions (1131, no change):
  *comply with new construction requirements*
- Change of use (1133, no change):
  *unheated to heated – comply as new construc.*
  *Group R to other – treat as alteration*
- Historic buildings (1134, no change):
  *special treatment for historic component only*
  *(but, are there historic mechanical systems?)*

# 2006 SEATTLE ENERGY CODE: Mechanical – Alterations

- Alterations (1132.2, Table 11-1):

  *for existing systems w/o economizer,*
  *alterations to comply with Table 11-1*
  *(including packaged units, air handlers,*
  *water-source heat pumps, boilers)*
  *same size replacement to be higher efficiency*
  *plus other features, limits on expansion –*
  *unless system complies w/Sec.1433*
  *intent is to bring non-conforming systems*
  *closer to the current code energy savings*

# 2006 SEATTLE ENERGY CODE: Reference Standard (RS) - 29

- Building envelope (RS-29, 3.3.1):
  *standard design to have metal stud walls and same glazing area as proposed if <Table 13-1*
- Fan system (RS-29, 3.4.4):
  *standard design to have hp per Std 90.1-2007*
- Prototype HVAC systems (RS-29, Table 3-3):
  *#1 & #2: electric resistance heat not allowed*
  *#5 & #6: chiller to be water-cooled*

# 2006 SEATTLE ENERGY CODE: Mechanical – Residential

- System sizing limits (503.2.2, revised):
  *max. size of 150% of design load (was 200%)*
  *if AFUE ≥ 90%, then 150-250% (was unlimited)*
  *submit calcs with building permit application*
- Economizer (503.7, no change):
  *refers to Ch. 14, sections 1413 and 1433*
  *1433 has exception 8 for small resid. systems*
- Controls for multi-family (503.8.3.4, revised):
  *refers to Ch. 14, sections 1412 and 1432*

# 2006 SEATTLE ENERGY CODE: Reference Info: Mechanical Systems

- Client Assistance Memos (CAM):
  414: STFI Mechanical Permits for Commercial and Multifamily Residential
  415: Applicant Responsibilities and Plan Requirements for Mechanical Permits
  419: Commissioning for Nonresidential Mechanical and Lighting Systems
- Electronic forms:
  Equipment Sizing Form
  RS-29 Energy Enduse Summary Form
  RS-29 Design Parameter Comparison Form

# 2006 SEATTLE ENERGY CODE: DPD Process: Mechanical Systems

- Mechanical permit application:
  Appointment (206-684-8850) now required for:
  - mechanical submittals that require plan review
  - 3 or more STFI submittals
- Field inspection:
  Provide preliminary commissioning report to mechanical inspector

# 2006 SEATTLE ENERGY CODE: Lighting – New Construction

- Furniture-mounted lighting (1512.2):
  *required to have automatic shut-off device, or else be included in lighting power allowance*
- Photocell control for lighting in daylight zones (1513.3, no change):
  *automatic dimming or stepped-switching within 15 ft of window & under skylights*
  *stepped switching must have separate step to control each lamp within a fixture*

# 2006 SEATTLE ENERGY CODE: Lighting – New Construction

- Efficient interior lighting (1530, Table 15-1):

  *office: 0.95 W/ft$^2$ (3$^{rd}$ generation T-8)*

  *retail: 1.5 W/ft$^2$ base + merchandise display of*

  *1.5 W/ft$^2$ for tenant spaces < 3,000 ft$^2$*

  *1.2 W/ft$^2$ for tenant spaces > 3,000 ft$^2$*

  *(more lumens from ceramic metal halide)*

- Exterior lighting (1532, no change)

  *retained existing Seattle Energy Code criteria*

  *(did not adopt new State text & table)*

# 2006 SEATTLE ENERGY CODE: Lighting – Additions et al

- Additions (1131, no change):
  *comply with new construction requirements*
- Change of use (1133, no change):
  *unheated to heated – comply as new construc.*
  *Group R to other – treat as alteration*
- Historic buildings (1134, no change):
  *special treatment for historic component only (generally rare, but a few lighting cases)*

# 2006 SEATTLE ENERGY CODE: Lighting – Alterations

- Wattage (1132.3, Table 15-1, no change):

  *must comply with W/ft$^2$ if > 60% of fixtures in a room are changed*

  *otherwise, maintain or reduce W/ft$^2$*

- Controls (1132.3, no changes):

  *occupancy sensors for new offices < 300 ft$^2$*

  *comply with daylighting requirements where new wiring is being installed or fixtures being relocated to a new circuit*

# 2006 SEATTLE ENERGY CODE: Lighting – Residential

- Hotel/motel guest rooms (505.1, no change):
  *need master switch at door*
- Lighting power (505.2, no change):
  *guest rooms & corridors to comply with T.15-1*
- Outdoor lighting (505.3, new):
  *to be high-efficacy or have motion-sensor*
- Recessed lighting (502.4.4, revised):
  *to be IC-rated, 2.0 cfm max ASTM E283 tested*

# 2006 SEATTLE ENERGY CODE: Reference Info: Lighting & Electrical

- Client Assistance Memos (CAM):
  419: Commissioning for Nonresidential Mechanical and Lighting Systems
- Electronic forms:
  Lighting Summary Form
  Equipment Sizing Form

# 2006 SEATTLE ENERGY CODE: DPD Process: Lighting & Electrical

- Electrical counter permit application:
  Provide Lighting Summary Form
  Show variable speed drive on motors ≥ 7.5 hp
  Transformers to comply with TP-1
- Field inspection:
  Demonstrate automatic daylighting controls and occupancy sensor controls to electrical insp.
  Document that recessed lighting complies with air leakage limitations

# 2006 SEATTLE ENERGY CODE: Further Information

- Summary of changes and text of amendments: Seattle Energy Code website, 2006 SEC update *(www.seattle.gov/dpd/energy)*
- Insert pages, updates to forms, etc: available for download on Energy Code website
- DPD staff for questions on projects in Seattle: Energy/Mechanical plan review: 206-684-7846 Inspections: 206-684-8900